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Introduction

The Japanese prevalence of smoking among people aged 15 years and over is the highest, at 25.7% of the population, among the G7 countries. This proportion, however, has dropped from 37.4% in 1990 and 32.9% in 2000.¹ Large cohort studies have provided evidence of the health effects of smoking. It is reported that the life expectancy of male smokers aged 40 years was 3.9 years shorter than that of male never-smokers and 1.6 years shorter than that of ex-smokers; the corresponding differences for women were 3.6 and 3.3 years, respectively.²

Reduction of the smoking rate has been one of the central issues of public health policy, and various measures have been taken to achieve this reduction in Japan. Among tobacco-control programmes, the following six interventions are regarded as being cost-effective: price increase, ban on smoking in public- and work-places, improvement of public knowledge about smoking, restriction of advertisement, health warnings on tobacco products and cessation support for smokers.³ Joossens and Raw (2006) indexed the level of development of these six measures as the Tobacco Control Scale (TCS) in order to compare the tobacco control policies of 30 European countries.⁴ The TCS in Japan in 2005 was lower than in all 30 European countries⁵; tobacco control in Japan was slow to take hold.

Recently, the Japanese government has been implementing several measures. Smoking bans in public places have been expanded since the

enforcement of the Health Promotion Act in May 2003. From June 2006, smoking cessation support for dependent smokers has been reimbursed by the public health insurance system. The tobacco price has been raised; this measure, which is highly weighted in the TCS, was delayed in Japan. However, it is planned that the tobacco tax will be raised from October 2010. This tax increase will result in a 33% elevation of the retail price of common tobacco products (one pack of 20 cigarettes) from 300 Japanese yen (USD 3.3, 1 USD = 90 JPY) to 400 Japanese yen (USD 4.4). The mark-up rate of this price increase is the highest in 30 years.

What do the Japanese think about tighter tobacco regulations and sharp price rises? Previous studies consistently found that never-smokers and ex-smokers are more supportive of tobacco regulations as compared to current smokers.^{6 7} Among current smokers, it is reported that higher-nicotine-dependent smokers object to anti-smoking policies.⁶ However, research on Japanese attitudes to the recent tobacco control measures for both smokers and non-smokers is scarce, and little is known about whether these measures are supported by the public. The first aim of this research is to clarify the attitudes towards smoking policies.

The end goal of tobacco control is to make current smokers quit smoking. In 2006, we used a Discrete Choice Experiment (DCE) to investigate about what information and individual characteristics drove smokers to attempt to quit.⁸ Was there any change in quit attempts before and after? The second aim was to examine preference changes in quit attempts according to the reinforcement of tobacco control policies.

Methods

Data

We conducted a questionnaire survey of Japanese adults who registered at a consumer monitoring investigative company (the total number of monitors was about 220,000). The data sampling was performed in the following two stages. First, we randomly selected over 6,500 samples from the monitors and classified smoking status. We stratified the population by age and gender to correspond these demographic characteristics to the national

figures. A current smoker is defined as someone who has been smoking for a month or more and has thus far, smoked at least 100 cigarettes.⁹ The current smokers were grouped into three types based on the Fagerstrom Test for Nicotine Dependence (FTND). By aggregating the responses to the FTND, we defined respondents scoring a total of 0–3 points as having low nicotine dependence (L-type), a total of 4–6 points as middle nicotine dependence (M-type), and a total of 7 points and above as displaying high nicotine dependence (H-type).¹⁰ Next, we surveyed a random sample of around 200 respondents from the three categories (H-type, M-type and L-type) and invited them to participate in the DCE described below.

Smoking policy attitudes

We asked the following two questions about two tobacco policies under debate: price increase and the law amendment of the Tobacco Industries Act. Each respondent was asked to use a five-point scale to assess attitudes towards two particular policy arguments.

- (i) There is an argument that tobacco prices (per pack of 20 cigarettes) should be raised to 600–700 Japanese yen (6.6–7.7 USD), which is similar to the levels in other developed countries. How do you feel about this argument? (1 = totally agree, 5 = totally disagree).
- (ii) The current aim of the Tobacco Industries Act is to realize the sound and consistent development of tobacco industries and to secure stable governmental revenue from tobacco tax. There is an argument that the government should amend the law to realize health promotion in the nation. How do you feel about this argument? (1 = totally agree, 5 = totally disagree).

Discrete Choice Experiment on quit attempts

In DCE, any goods or service is described by bundling its attributes or characteristics. The extent to which an individual values a goods or a service can be evaluated by the selection of hypothetical choices that mimic the daily decision-making process. This technique has been applied in healthcare

settings and the outcomes have revealed that DCE results have internal validity and consistency.¹¹

It is very important to choose proper attributes that express a goods or service. Too many attributes can impose an information-processing burden on respondents, while too few can prevent an accurate depiction of its characteristics. We used the same DCE questionnaire set that was used in the 2006 wave of surveys. This set contains the following five attributes: the price of a pack of cigarettes, fines for smoking in public places¹², long-term health risks (mortality risk)^{13 14}, short-term health risks (risk of upper respiratory infection)¹⁵ and health risks to others.¹⁶ Details of the setting of the DCE are reported elsewhere.⁸ Table 1 summarises the attributes and levels included in the DCE.

The number of possible combinations is $4 \cdot 2 \cdot 3 \cdot 3 \cdot 2 = 144$. However, the number of profiles is too high to answer if we consider them all. We used an orthogonal planning method to avoid this problem. Finally, we reduced the number of scenarios to 16 and divided them into 2 categories (8 scenarios each). Respondents were randomly assigned to either of the two categories. Totally, we gathered 1,600 samples for each of the three types of nicotine dependence.

<Table 1>

We also included age, gender and knowledge about smoking as independent variables. Previous research showed that quitting smoking is closely associated with knowledge about the harm of smoking¹⁷. We asked respondents about the prevalence of smoking and its association with several smoking-related diseases. Each question contained four choices. On the basis of the total number of correct answers, we created an index of knowledge about smoking.

Respondents were requested to answer whether to quit or continue to smoke in eight hypothetical scenarios in which the levels of attributes were different. Dependent variables were binary decisions of quit attempts; we estimated using the random parameter logit model, accommodating individual differences in the variance of random components. We assumed PRICE, AGE, GENDER, and KNOWLEDGE to be non-random parameters and attributes other than PRICE to be random parameters. Details of the estimation method have been shown in previous research.^{8 18} NLOGIT 4.0

(2007; Econometric Software Inc., NY, USA) and Stata11 (2009; Stata Corp., TX, USA) were used for the estimation.

Results

Table 2 carries the descriptive statistics of the samples at the first stage. The smoking prevalence is 25.2%, which is very similar to the 25.8% national level in 2008. By way of other characteristics, this sample includes younger and highly-educated people.

〈Table 2〉

Table 3 compares two waves of DCE respondents in 2006 and 2010. The average age of the sample is 41.3 (S.D. = 10.3) in 2006 and 42.1 (S.D. = 11.0) in 2010; there is no statistical difference between these two ages ($p = 0.1930$). With regard to the other characteristics, the sample in 2010 is not statistically different from that in 2006. The baseline characteristics of both sets of DCE respondents are almost the same.

〈Table 3〉

Table 4 shows the distribution of attitudes towards the tobacco price increase of a pack of 20 cigarettes to 600–700 Japanese yen (6.6–7.7 USD), similar to the levels in other developed countries. 20% of current smokers agree and 63% disagree with this. 80% of non-smokers agree and 6% disagree with this. As expected from previous evidence, current smokers and non-smokers conflict over the price increase of tobacco products in Japan. Among current smokers, 29% of low dependent smokers agree, while 49% disagree; on the other hand, among highly dependent smokers, these numbers are 13% and 75%, respectively. Those who totally disagree with price elevation are 32% of low dependent smokers and 59% of highly dependent smokers. The severer the nicotine dependence, the less current smokers support an increase in tobacco prices.

〈Table 4〉

In Japan, finance officials are the supervisory authority for uniform tax levy, control of retail prices and retail license approval.¹⁹ The governing law for this activity is the Tobacco Industries Act. The purpose of this law has been the consistent development of the tobacco industry and stable governmental revenue from tobacco tax, rather than the development of health promotion. Table 5 shows the distribution of attitudes towards the amendment of the law to stress health promotion. 25% of current smokers agree, while 45% disagree with this. 74% of non-smokers agree, whereas 6% disagree with this. Current smokers and non-smokers also conflict over the tobacco-related law amendment in Japan. Among current smokers, 36% of low dependent smokers agree and 34% disagree with this; on the other hand, among highly dependent smokers, 19% and 56%, respectively, agree and disagree. The proportion of support is higher than in case of price increase. Among those who totally disagree with price elevation, 21% are low dependent smokers and 43% are highly dependent smokers. The severer the nicotine dependence, the less current smokers support the legislation of consistent governmental consideration on health promotion.

〈Table 5〉

Table 6 shows the estimation results of the DCE in the 2010 survey. Assuming that random parameters are distributed normally, each random parameter has a mean estimate and a standard deviation (S.D.) estimate of each coefficient. For non-random parameters, mean estimates alone are reported. Furthermore, estimation results are reported for the three groups of nicotine dependence. A negative sign for the average of each parameter refers to a decrease in the probability of attempting to continue to smoke and therefore, an increase in attempts to quit.

The cigarette price parameter, PRICE, is negative and statistically significant for all groups of nicotine dependence. Price elevation brings about a significant increase in quit attempts. Results of non-price attributes vary with nicotine dependence. In highly dependent smokers, all the non-price attributes are not significant, while all attributes are significant for low dependent smokers. Higher-nicotine-dependent smokers are less responsive

to factors (except for tobacco price) that stimulate smokers' quit attempts.

⟨Table 6⟩

To analyse the overall change in preference for smoking between the two waves of the survey, we performed the log likelihood ratio test (LR – test). The twofold difference in log likelihood between the sum estimated from each year's data and the sum of the pooled data of the two waves represents Chi-squared distribution.²⁰ As a result of the test shown in Table 7, overall preference change is observed only in low and highly dependent smokers. There is no preference change in middle dependent smokers between 2006 and 2010. For those who changed overall preferences of smoking, Table 7 shows the results of the simulation of the probability of smoking continuation with respect to tobacco price change.

⟨Table 7⟩

⟨Figure 1⟩

To see the tendency of reinforcement of tobacco control policy, we compared tobacco continuation rates between 2006 and 2010. An overall decrease in continuation rate is observed for highly dependent smokers. In contrast, the continuation rate of smoking for low dependent smokers consistently increased.

Discussion

In this research, we examined support for tobacco control policies recently implemented in Japan and also compared quit attempts based on these policy changes, using a DCE questionnaire. The major findings of this research are as follows.

First, current smokers show lower support for price increase and legislation of health promotion than non-smokers. Within current smokers, those with higher nicotine dependence support these policies less. Second, the tobacco price consistently persuades smokers of all dependence levels to

attempt to quit smoking although factors such as risk information and penalty on smoking ban is helpful only to low dependent smokers. Third, with regard to the introduction of a strict tobacco control policy, the smoking continuation rate drops for highly dependent smokers, is stable for middle dependent smokers, and increases for low dependent smokers.

The result is that current smokers are less supportive of smoking policies; this support is inversely correlated to nicotine dependence, which confirms previous findings in various countries.^{6 7 21} Current smokers support the amendment of the aim of the Tobacco Industries Act more than they do price elevation. Price elevation directly puts a higher financial burden on current smokers. Meanwhile, this amendment is not accompanied by substantial regulation on smokers' behaviour. It is known that actions such as selling regulations for minors are supported even by adult smokers.⁶

It is reasonable that the impacts of price are so speedy and assured that they will affect the decisions of smokers of all nicotine dependence categories. Tobacco price has an instantaneous effect on current smokers. In contrast, health risks impact their future, more or less. Recently, there has been evidence suggesting that current smokers tend to be more myopic than non-smokers in that they emphasize present rewards than they do future ones.²² This tendency grows with the number of cigarettes they smoke per day and the more nicotine they inhale.²³ Although price increase certainly has a financial influence on smokers as long as they smoke, they are not always fined when they smoke in public places. It is also uncertain whether their health risks actualize as severe diseases. It is reported that smokers with unfavourable smoking behaviours underestimate various risks.¹⁸

The shift of preference for quit attempts is diverse according to nicotine dependence. A growing number of highly dependent smokers intend to quit around the introduction of tobacco control measures like price increase. The price increase planned in October 2010 in Japan is a drastic one. Because the financial disutility comes very close, highly dependent smokers with myopic time preferences may place importance on the dissolution of this disutility by smoking cessation. However, smokers with strong intentions to quit do not always succeed in cessation. A longitudinal study following up on smokers for 18 months showed that the more frequently highly dependent smokers attempted to quit, but the more likely they were to fail in abstinence from smoking.²⁴

It is also found that those who have myopic time preferences easily return to smoking.²⁵ Consequently, the myopic tendency of highly dependent smokers has a countervailing effect that strengthens their intention to quit and pulls them back into smoking.

To induce highly dependent smokers to quit attempts and cessation success at the same time, it is important to implement tobacco control measures based on a profound understanding of their time and risk preferences. In recent research, financial incentives for smoking cessation significantly increased the rate of smoking cessation.²⁶

Why do larger numbers of low dependent smokers aim to continue smoking? One possible explanation is that they protest against rapid changes in tobacco control policies in Japan. It is found that trust in the tobacco price policies of the Japanese government is low and that this trust is closely related to the perceived fairness of the policy.²⁷ Low dependent smokers may feel that a drastic change in the permissive policy for smokers is punitive and unfair. Another explanation is that low dependent smokers with strong intentions to quit have already succeeded after the 2006 wave of the survey.

Several limitations of this research are pointed out. First, we research attitudes towards only two tobacco-related policy changes. The questionnaire survey investigates attitudes to tobacco policy comprehensively²⁸. We particularly picked issues that attract public attention.

Second, smoking status was collected on a self-reporting basis. However, biochemical validation is not generally advised in low-contact population studies such as this because there is little incentive for participants to deceive the researcher of their true smoking status.²⁹

Third, there is the issue of generalizability. The sample used here includes more highly educated and rich people even though the smoking prevalence in the sample is almost the same as in national data. It is pointed out that myopic preference is inversely associated with education and income levels.³⁰ The sample studied here may cover a lower percentage of myopic and lower-nicotine-dependent smokers than in the total population of Japanese smokers.

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Table 1. Attributes and levels used in DCE

Attributes	Abbreviation	Levels	Level coding
Price of cigarettes (one pack, JPY)	PRICE	300	300
		400	400
		600	600
		800	800
Penalty with fine for smoking in public places	PENALTY	not in practice	0
		in practice	1
Overall mortality risk (Relative risk of non-smokers)	MORTALITY	1	0
		2	1
		3	2
Duration of bed rest caused by upper respiratory tract infection (per year)	REST	the same as non-smokers	0
		1 week longer than non-smokers	1
		2 weeks longer than non-smokers	2
Risk of lung cancer caused by passive smoking	PASSIVE	not increased	0
		significantly (around 30%) increased	1

Table 2. Descriptive statistics at the first stage of sampling

	Current smokers				Non-smokers		
	Subtotal	Low FTND	Middle FTND	High FTND	Subtotal	Never-smoker	Ex-smoker
Observations	1,643	535	723	385	4,872	3,907	965
Smoker ratio			0.25			0.75	
Sub-sample ratio	1.00	0.33	0.44	0.23	1.00	0.80	0.20
Male ratio	0.67	0.63	0.68	0.74	0.44	0.39	0.64
Average age	41.4	39.7	41.5	43.6	40.3	38.9	46.2
Ratio of higher education	0.57	0.62	0.55	0.51	0.64	0.64	0.61
Ratio of full-time worker	0.68	0.64	0.69	0.71	0.48	0.45	0.60
Household income (1000 USD)	69.0	70.0	67.4	70.7	66.5	65.7	69.6

Notes: Higher education means university (2 years and 4 years), technical academy and graduate school. Full-time worker does not contain students, housewives and part-time workers.

Table 3. Baseline characteristics of Discrete Choice Experiment (DCE) respondents

	2006				2010			
	Subtotal	Low FTND	Middle FTND	High FTND	Subtotal	Low FTND	Middle FTND	High FTND
Observations	616	205	206	205	600	200	200	200
Male ratio	0.77	0.70	0.77	0.85	0.78	0.70	0.78	0.85
Average age	41.3	39.3	40.4	44.2	42.1	40.0	42.1	44.2
Ratio of higher education	0.62	0.67	0.57	0.63	0.61	0.69	0.62	0.51
Ratio of full-time worker	0.75	0.72	0.74	0.80	0.74	0.67	0.78	0.78
Household income (1000 USD)	71.9	75.4	63.1	75.4	68.7	69.4	68.3	68.4

Table 4. Attitudes towards increase in tobacco price

	Current smokers				Non-smokers		
	Subtotal	Low FTND	Middle FTND	High FTND	Subtotal	Never-smoker	Ex-smoker
1 = Totally agree	0.08	0.10	0.08	0.06	0.52	0.53	0.48
2 = Relatively agree	0.12	0.19	0.10	0.07	0.28	0.28	0.28
3 = Neutral	0.17	0.23	0.15	0.11	0.14	0.14	0.15
4 = Relatively disagree	0.18	0.17	0.19	0.16	0.04	0.03	0.06
5 = Totally Disagree	0.45	0.32	0.47	0.59	0.02	0.01	0.02
Average	3.8	3.4	3.9	4.1	1.7	1.7	1.9

Table 5. Attitudes towards the law amendment of the Tobacco Industries Act

	Current smokers				Non-smokers		
	Subtotal	Low FTND	Middle FTND	High FTND	Subtotal	Never-smoker	Ex-smoker
1 = Totally agree	0.09	0.12	0.09	0.07	0.43	0.44	0.40
2 = Relatively agree	0.16	0.21	0.15	0.12	0.31	0.31	0.31
3 = Neutral	0.30	0.35	0.29	0.25	0.20	0.20	0.20
4 = Relatively disagree	0.15	0.13	0.17	0.13	0.04	0.03	0.05
5 = Totally Disagree	0.30	0.21	0.30	0.43	0.02	0.02	0.03
Average	3.4	3.1	3.4	3.7	1.9	1.9	2.0

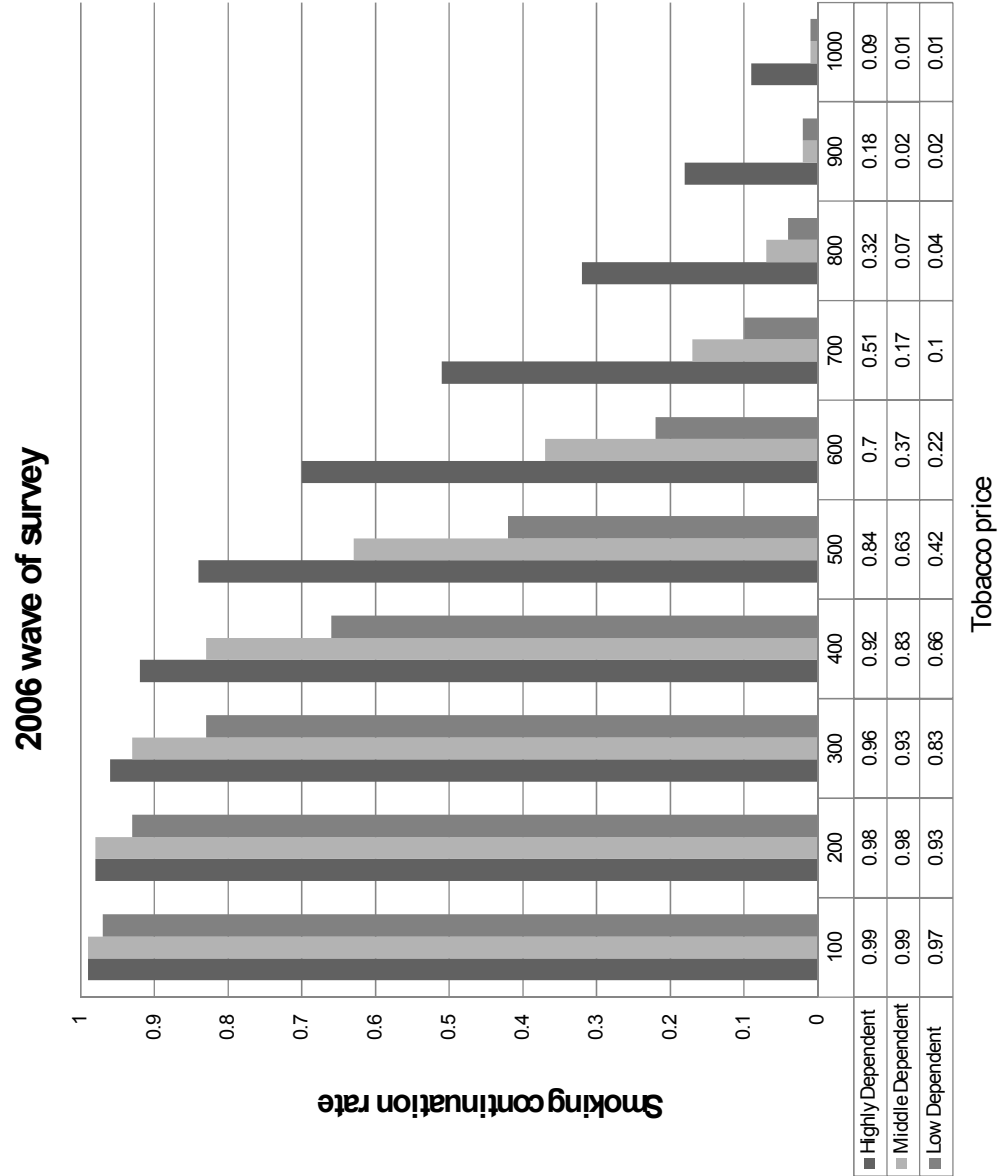
Table 6. Discrete Choice Experiment (DCE) results in 2010

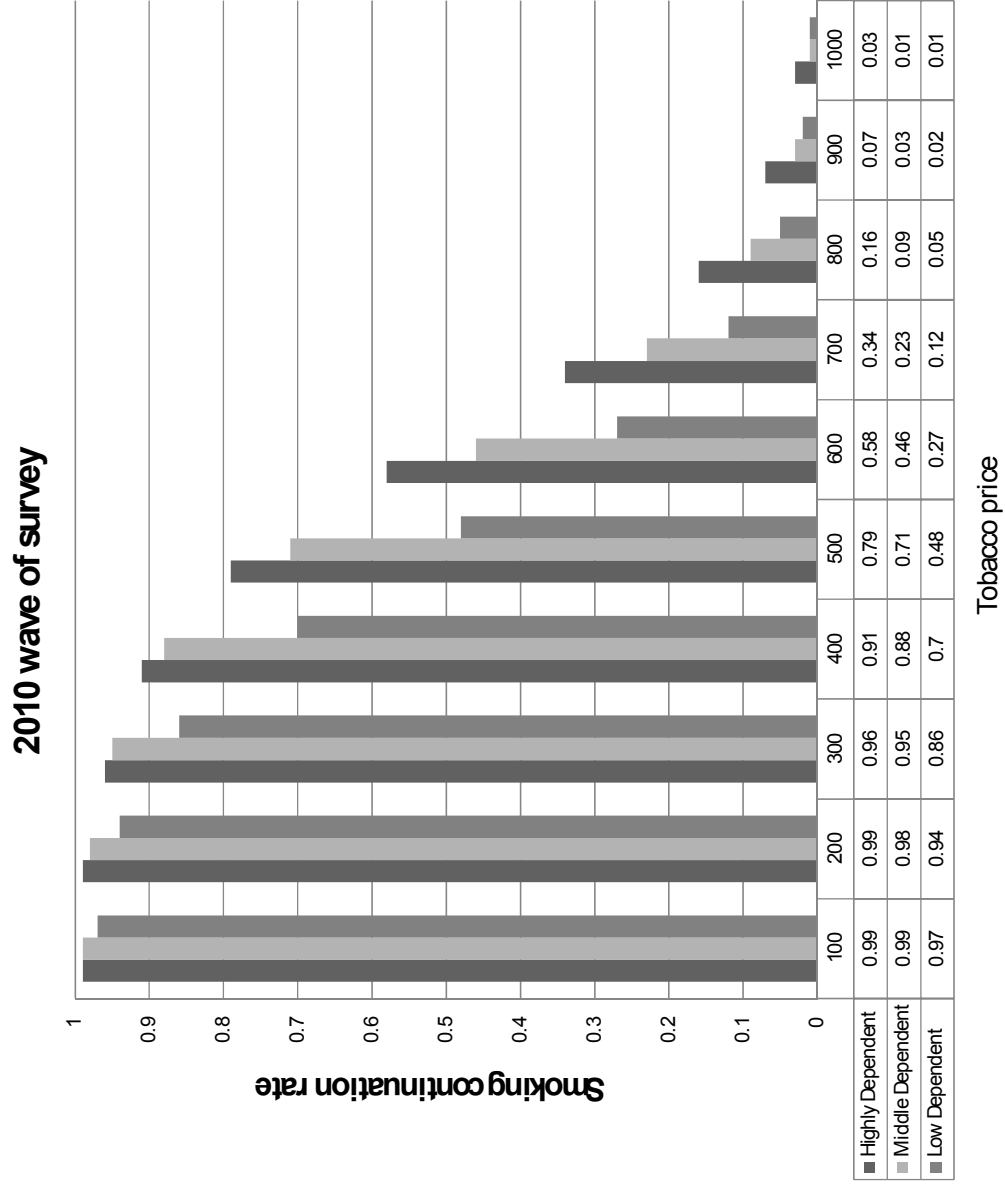
	Low Dependent				Middle Dependent				High Dependent			
n Log likelihood Initial Log likelihood Pseudo R-squared	1600 -825.499 -1107.910 0.255				1600 -814.130 -1142.307 0.258				1600 -793.614 -1066.801 0.256			
	Estimates	S.E.	t statistics		Estimates	S.E.	t statistics		Estimates	S.E.	t statistics	
	Non-random parameters											
	Constant	4.7706	0.6982	6.832		6.8624	0.9005	7.621		6.2295	0.7646	8.147
PRICE	-0.0094	0.0008	-11.622		-0.0106	0.0011	-9.903		-0.0098	0.0007	-13.199	
AGE	-0.0093	0.0104	-0.891		0.0039	0.0111	0.348		0.0097	0.0110	0.883	
GENDER	0.2147	0.2683	0.800		-0.2136	0.3047	-0.701		-0.7619	0.2912	-2.616	
KNOWLEDGE	0.4202	0.0943	4.456		-0.1568	0.0857	-1.830		-0.0951	0.0832	-1.143	
Random parameters												
Mean												
PENALTY	-0.4258	0.2062	-2.065		-0.1825	0.2361	-0.773		-0.0495	0.2159	-0.229	
MORTALITY	-0.6070	0.1546	-3.926		0.0357	0.1902	0.188		0.0899	0.1469	0.612	
REST	-0.5156	0.1432	-3.601		0.0260	0.1571	0.166		-0.0693	0.1466	-0.473	
PASSIVE	-1.0747	0.2607	-4.123		-0.2099	0.2266	-0.926		-0.0187	0.1917	-0.098	
S.D.												
PENALTY	1.3454	0.4074	3.302		1.9153	0.4282	4.473		1.7429	0.3710	4.698	
MORTALITY	1.5269	0.2125	7.187		2.2575	0.3954	5.709		1.4027	0.1993	7.038	
REST	1.1103	0.1881	5.902		1.4505	0.2284	6.352		1.4225	0.1926	7.386	
PASSIVE	2.3363	0.3490	6.694		1.8895	0.3370	5.607		1.1121	0.3026	3.675	

Table 7. Preference change between 2006 and 2010

	LR (2006)	LR(2010)	LR (pooled data)	Chi-squared Statistics	Test result 5% significant level	Test result 1% significant level
Low Dependent	-843.202	-825.499	-1685.879	34.356	Significant	Significant
Middle Dependent	-838.098	-814.130	-1662.954	21.452	Not significant	Not significant
Highly Dependent	-815.526	-793.614	-1626.455	34.630	Significant	Significant

Figure 1. Changes in smoking continuation rate with respect to cigarette price





Note: All independent variables other than PRICE are fixed at the sample mean.